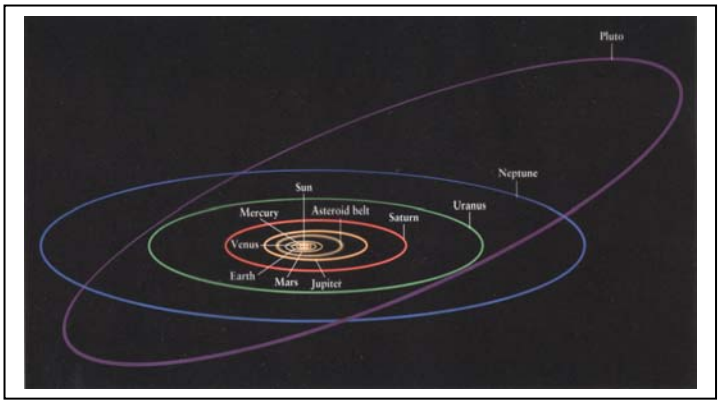
How Big is Our Solar System?



Our solar system is so big it is almost impossible to imagine its size if you use ordinary units like feet or miles. The distance from Earth to the Sun is 93 million miles (149 million kilometers), but the distance to the farthest planet Neptune is nearly 3 billion miles (4.5 billion kilometers). Compare this to the farthest distance you can walk in one full day (70 miles) or that the International Space Station travels in 24 hours (400,000 miles).

The best way to appreciate the size of our solar system is by creating a scaled model of it that shows how far from the sun the eight planets are located. Astronomers use the distance between Earth and sun, which is 93 million miles, as a new unit of measure called the Astronomical Unit. It is defined to be exactly 1.00 for the Earth-Sun orbit distance, and we call this distance 1.00 AUs.

Problem 1 - The table below gives the distance from the Sun of the eight planets in our solar system. By setting up a simple proportion, convert the stated distances, which are given in millions of kilometers, into their equivalent AUs, and fill-in the last column of the table.

Planet	Distance to the Sun in millions of kilometers	Distance to the Sun in Astronomical Units
Mercury	57	
Venus	108	
Earth	149	
Mars	228	
Jupiter	780	
Saturn	1437	
Uranus	2871	
Neptune	4530	

Problem 2 – Suppose you wanted to build a scale model of our solar system so that the orbit of Neptune was located 10 feet from the yellow ball that represents the sun. How far from the yellow ball, in inches, would you place the orbit of Jupiter?

Problem 1 - The table below gives the distance from the Sun of the eight planets in our solar system. By setting up a simple proportion, convert the stated distances, which are given in millions of kilometers, into their equivalent AUs, and fill-in the last column of the table.

Answer: In the case of Mercury, the proportion you would write would be

$$\frac{149 \text{ million km}}{1 \text{ AU}} = \frac{57 \text{ million km}}{X} \quad \text{then } X = 1 \text{ AU} \times (57/149) = 0.38$$

Planet	Distance to the Sun in millions of kilometers	Distance to the Sun in Astronomical Units
Mercury	57	0.38
Venus	108	0.72
Earth	149	1.00
Mars	228	1.52
Jupiter	780	5.20
Saturn	1437	9.58
Uranus	2871	19.14
Neptune	4530	30.20

Problem 2 – Suppose you wanted to build a scale model of our solar system so that the orbit of Neptune was located 10 feet from the yellow ball that represents the sun. How far from the yellow ball, in inches, would you place the orbit of Jupiter?

Answer: The proportion would be written as:

$$\frac{30.20 \text{ AU}}{10 \text{ feet}} = \frac{5.2 \text{ AU}}{X} \quad \text{then} \quad X = 10 \text{ feet} \times (5.2/30.2) \quad \text{so } X = \mathbf{1.72 \text{ feet}}$$

Since 1 foot = 12 inches, the unit conversion is written as

$$1.72 \text{ feet} \times \frac{12 \text{ inches}}{1 \text{ foot}} = \mathbf{20.64 \text{ inches}}.$$